REMARKS

The objections to the drawings as failing to comply with 37 CFR § 1.84(p)(5), set forth in Items 1 and 2 on pages 2 and 3 of the Office Action mailed June 17, 2004, are noted. Applicants have amended the specification of the above-identified application in light of the indicated reference characters which the Examiner contends (1) are mentioned in the description but not in the drawings, or (2) are in the drawings but not mentioned in the specification. In particular, note that in connection with Fig. 2D, the enclosed Substitute Specification now refers to reference numeral "17b". Note lines 14 and 15 on page 15 of the enclosed Substitute Specification. In connection with reference characters 17f, 17g, note the description in the third paragraph on page 23 of the enclosed Substitute Specification. With respect to the reference characters listed in Item 2 on pages 2 and 3 of the Office Action mailed June 17, 2004, note the enclosed Substitute Specification on page 13, line 14, on page 15, line 13, page 19, lines 13 and 14, page 23, line 10, and the description on page 26. In view of amendments to the specification, it is respectfully submitted that all of the reference characters which the Examiner contends are not mentioned in the description, are now set forth in the Substitute Specification.

The requirement for corrected drawing sheets as set forth in Item 1 on page 2 of the Office Action mailed June 17, 2004, is respectfully traversed. In light of amendments to the specification, it is respectfully submitted that the drawing figures are now consistent with the specification.

The requirement for amendments to the specification or corrected drawing sheets, set forth in Item 2 bridging pages 2 and 3 of the Office Action mailed June 17, 2004, is noted. In view of amendments to the specification to add the reference characters in the description, it is respectfully submitted that the required reply has been made.

The requirement for a Substitute Specification in proper idiomatic English and in compliance with 37 CFR § 1.52(a) and (b), set forth in Item 3 on page 3 of the Office Action mailed June 17, 2004, is noted. Applicants are submitting herewith, as an Appendix, a Substitute Specification. Also enclosed herewith, as an Appendix, is a marked-up copy of the original specification, showing the changes made in the Substitute Specification. It is hereby stated that the Substitute Specification contains no new matter, as can be seen by the changes on the marked-up copy. In view of the presently submitted Substitute Specification, the requirement for a Substitute Specification has been satisfied.

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have cancelled original claims 1-28 without prejudice or disclaimer, and are adding new claims 29-40 to the application. All of these newly added claims are directed to an exhaust gas processing apparatus, with claims 29 and 37 being independent claims.

Independent claim 29 recites that the apparatus has (1) a discharge generation means and (2) a catalyst downstream of the discharge generation means. Claim 29 further recites that this discharge generation means includes an

insulation body, one electrode covered by an outer skin of the insulation body, and another electrode formed with a bare wire, with this another electrode being arranged adjacent to the insulation body, along the insulation body. Claim 29 still further recites that in processing of an exhaust gas including particle substances from a diesel engine, by use of the catalyst combined with the discharge generation means and in response to conditions of the exhaust gas, NO and NO_2 can be removed, and an amount and a component of nitrogen oxides of a generation necessary for processing the particle substances can be controlled, whereby using the catalyst the particle substances can be removed under a low temperature of about 300°C.

Claims 30 and 31, each dependent on claim 29, respectively recites material of the catalyst; and recites that the discharge generation means is in a first section of the exhaust gas processing apparatus and the catalyst is in a second section of the exhaust gas processing apparatus, the second section being downstream of the first section. Claims 32 and 33, respectively dependent on claims 29 and 32, respectively recites further structure of a source of alternating current high voltage, connected to the one and another electrode so as to apply an alternating current high voltage thereto; and recites further structure of a controller that controls voltage output of the source of alternating current high voltage, with this voltage output being applied to the one and another electrodes of the discharge generation means. And claim 34, dependent on claim 33, recites further structure of a sensor located at an input to the exhaust gas processing apparatus, for sensing the particle substances

and sending a sensed value to the controller. Claims 35 and 36, each dependent on claim 29, respectively defines a gas supply conduit for supplying the exhaust gas including the particle substances from the diesel engine to the discharge generation means of the recited apparatus; and recites that the another electrode is wound around the insulation body, having a spiral shape.

In connection with claims 29-36, note, for example, Figs. 1A and 2A-2F of Applicants' original disclosure.

New independent claim 37 recites that the apparatus has (1) a discharge generation means and (2) a catalyst downstream of the means, with this discharge generation means being that recited in claim 29 and with the recitation of processing of the exhaust gas from a diesel engine being that recited in claim 29; the apparatus further including an ammonia high pressure reaction means or a plasma synthesis means, with a necessary amount of ammonia being generated, whereby using the catalyst the particle substances can be removed under a low temperature of about 300°C. Note, for example, Fig. 4A. Claims 38 and 39, dependent respectively on claims 37 and 38, respectively defines further structure of a source of alternating current high voltage, connected to the one and another electrodes so as to apply an alternating current high voltage thereto; and defines further structure of a controller that controls voltage output of the source of alternating current high voltage, with the voltage output being applied to the one and another electrodes of the discharge generation means. Claim 40, dependent on claim 39, defines further structure of a

sensor located at an input to the exhaust gas processing apparatus, for sensing the particle substances and sending a sensed value to the controller.

The claim objections set forth in Item 4 on page 3 of the Office Action mailed June 17, 2004, are noted. It is respectfully submitted that these objections are moot, in light of newly added claims 29-40, and canceling of previously considered claims 1-28.

The rejection of various of the previously considered claims under the second paragraph of 35 USC §112, as being indefinite, set forth in Items 6-66 on pages 4-9 of the Office Action mailed June 17, 2004, is noted. In view of the presently amended claims, it is respectfully submitted that the reasons for this indefiniteness rejection are now moot. Thus, the phrase "NOx" has been omitted from the claims, the claims reciting "nitrogen oxides". While the phrase "NOx" is used in many patents, including claims thereof (note patents applied in the prior art rejections in the Office Action mailed June 17, 2004), the phrase has been omitted to facilitate proceedings herein. Moreover, the claims do not include the phrase "such as"; and, furthermore, the present claims recite that the another electrode is "arranged adjacent to the insulation body, along the insulation body". Moreover, all of the claims now recite an exhaust gas processing apparatus. Furthermore, the claims do not include the word "etc."; and, moreover, the recitation "said electrode necessary for processing" has been omitted from the present claims. Other recitations objected to by the Examiner in previously considered claims, such as the recitation "which is burdened to alumina" has been omitted from the present claims, whereby any

question as to whether such recitations are unclear is moot. Furthermore, the recitation "a catalyst is burden to said wire" (note original claim 10) has been omitted from the present claims, as has the recitation "sulfuric oxide which is burdened in advanced" (note previously considered claim 18), whereby indefiniteness of these recitations is moot. Various questions raised by the Examiner with respect to antecedent basis for recitations in the previously considered claims are moot, in view of the presently amended claims.

As can be seen from a full review of the present claims, Applicants have made a bona fide attempt to amend their claims so as to overcome all issues raised by the Examiner under the second paragraph of 35 USC §112. If the Examiner is of the opinion that issues still remain under the second paragraph of 35 USC §112, the Examiner is respectfully requested to contact the undersigned so as to resolve any remaining issues. The Examiner is thanked in advance for cooperating with this request.

Applicants respectfully submit that all of the claims now presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed June 17, 2004, that is, the teachings of the U.S. patents to Goto, No. 5,576,970, to Watanabe, et al., No. 5,263,317 and to Penetrante, et al., No. 6,374,595, under the provisions of 35 USC §102 and 35 USC §103.

It is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such an exhaust gas

processing apparatus as in the present claims, having the specified discharge generation means and the catalyst downstream of the discharge generation means, with the discharge generation means including an insulation body, one electrode covered by an outer skin of the insulation body and another electrode formed with a bare wire, the another electrode being arranged adjacent to the insulation body, along the insulation body; and whereby, in processing of an exhaust gas including particle substances from a diesel engine, by use of the catalyst combined with the discharge generation means and in response to conditions of the exhaust gas, NO and NO_2, and an amount and a component of nitrogen oxides of a generation necessary for processing the particle substances, can be controlled, whereby using the catalyst the particle substances can be removed under a low temperature of about 300°C. See claim 29; note also claim 37.

It is respectfully submitted that these references would have neither taught nor would have suggested such exhaust gas processing apparatus as discussed previously, having the discharge generation means and operation in processing as discussed previously, and wherein the apparatus includes further an ammonia high pressure reaction means or a plasma synthesis means, with a necessary amount of ammonia being generated. See claim 37.

Furthermore, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested such an exhaust gas processing apparatus as in the present claims, having features as discussed previously in connection with claims 29 and 37, and furthermore wherein the catalyst is selected

from the group of materials as in claim 30; and/or wherein the discharge generation means and catalyst are respectively in first and second sections of the processing apparatus (see claim 31); and/or wherein the apparatus further includes a source of alternating current high voltage, connected to the electrodes of the discharge generation means (see claims 32 and 38), the apparatus further including a controller that controls voltage output of the source of alternating current high voltage (see claims 33 and 39), the apparatus still further including a sensor located at an input to the processing apparatus (see claims 34 and 40); and/or wherein the another electrode is wound around the insulation body, having a spiral shape (see claim 36).

According to the present invention, having the discharge generation means as recited in the present claims, particle substances can be removed from the exhaust gas from a diesel engine in a real time; and, moreover, control of energy used in removing the particle substances can easily and precisely be carried out in a short time, so that the particle substances can be completely decomposed, by the discharge phenomena, easily and effectively, without use of undue amounts of energy. Moreover, such control of the energy used for completely removing the particle substances can easily be achieved, notwithstanding that, in the diesel engine, the nitrogen oxide concentration varies due to change in operation of the diesel engine.

As for advantageous effects of the present invention, see pages 27-29 of the enclosed Substitute Specification.

Goto discloses a nitrogen oxide removal control apparatus and a method for reducing nitrogen oxide concentration in an exhaust gas, by controlling an amount of ammonia which is injected to the exhaust gas of a gas turbine in a power generation plant. As seen in Fig. 1 of this patent, the combined cycle power plant includes, inter alia, a nitrogen oxide removal device 15 provided in a flow path of exhaust gas to reduce NO_X emission, this patent disclosing an ammonia injection/dry selective catalytic reduction decomposition method as one nitrogen oxide removal method applied in the nitrogen oxide removal device. See column 2, lines 3-16. Note particularly column 3, lines 39-58, for a description of the nitrogen oxide removal control apparatus in this patent. See also the paragraph bridging columns 3 and 4 of this patent.

It is respectfully submitted that Goto would have neither taught nor would have suggested such apparatus as in the present claims, including the discharge generation means, much less such discharge generation means which includes the insulation body, one electrode covered by an outer skin of the insulation body and another electrode formed with a bare wire, with the another electrode being arranged adjacent to the insulation body, along the insulation body, with processing as in the present claims.

Watanabe, et al. discloses an exhaust gas purifying apparatus for an automobile diesel engine, the apparatus forming an electric field between a pair of electrodes, thereby collecting diesel particulates on one of the pair of electrodes. This patent discloses that when a corona discharge is generated by a voltage

applied to the pair of electrodes, the diesel particulates can be further charged, and they can be collected more securely. The purifying apparatus includes a cylindrical member constituting one of the pair of electrodes, an electrode member disposed in a central portion of the cylindrical member in a manner extending in an axial direction and constituting another one of the pair of electrodes, and a scraper for scraping a diesel particulates layer depositing on an inner surface of the cylindrical member. See column 1, lines 52-61; and column 2, lines 15-25. In another embodiment described in Watanabe, et al., the exhaust gas purifying apparatus includes an insulator insulating the pair of electrodes electrically, with an air introducing member for supplying fresh air onto a surface of the insulator, or wherein a diesel particulates burning member is disposed adjacent to a surface of the insulator so as to ignite and burn diesel particulates depositing on a surface of the insulator. See column 3, lines 10-14 and 31-41.

It is respectfully submitted that Watanabe, et al. would have neither taught nor would have suggested such exhaust gas processing apparatus as in the present claims, having the recited discharge generation means and a catalyst downstream of the discharge generation means, with the discharge generation means including the insulation body, one electrode covered by an outer skin of the insulation body and another electrode formed with a bare wire, the another electrode being arranged adjacent to the insulation body, along the insulation body, as in the present claims, and advantages thereof as discussed previously. Note that Watanabe, et al. discloses use of a pair of electrodes for collecting diesel particulates which are

charged, as, e.g., a substitute for apparatus employing a ceramic filter, and would have neither taught nor would have suggested the combination of structures as in the present claims, and in particular wherein the discharge generation means has the recited electrode structure as in the present claims, and advantages thereof.

The contention by the Examiner in Item 77 on page 11 of the Office Action mailed June 17, 2004, that Watanabe, et al. discloses a particle substance processing apparatus with a ceramic filter and sensing means to detect a condition, is noted. However, it is respectfully submitted that the structure of Watanabe, et al. uses the electrodes to establish an electric field for particulate removal, as a substitute for the conventional apparatus employing a ceramic filter. It is respectfully submitted that Watanabe, et al. teaches away from using a ceramic filter.

Penetrante, et al. discloses NO_x reduction by NO_x trap technology, with systems for decomposing NO_x to N_2 and other benign gases in oxygen-rich environments. This patent discloses a non-thermal plasma gas treatment of NO to produce NO_2 which is then combined with a catalytic storage reduction treatment, for example, a lean NO_x trap, to enhance NO_x reduction in oxygen-rich vehicle engine exhausts, the NO_2 from the plasma treatment being adsorbed on a nitrate-forming material, such as an alkali material, and stored as a nitrate, an engine controller periodically running a brief fuel-rich condition to provide hydrocarbons for a reaction that decomposes the stored nitrate into benign products such as N_2. Note column 3, lines 26-41. See also column 4, lines 36-42. Note further column 5, lines 31-38 and 47-52; and column 6, lines 15-26. note also column 7, lines 7-9.

It is respectfully submitted that Penetrante, et al. would have neither taught nor would have suggested the present claimed exhaust gas processing apparatus, including a discharge generation means as in the present claims, which comprises the insulation body, one electrode covered by an outer skin of the insulation body and another electrode formed with a bare wire, and with the another electrode being arranged adjacent to the insulation body, along the insulation body, and advantages of this structure as discussed in the foregoing.

In the Office Action mailed June 17, 2004, the Examiner points to various method limitations in the previously considered claims, contending that these method limitations in the apparatus do not further limit the apparatus. However, as can be seen in the foregoing, the present claims define structure, including structure capable of performing various processing, different from the structure of the applied prior art. That is, it is respectfully submitted that the teachings of the applied prior art do not disclose, nor would have suggested, the structure of the present claims, and capable of performing functions recited in the present claims, as shown in the foregoing.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Antonelli, Terry, Stout & Kraus,

LLP Deposit Account No. 01-2135 (Docket No. 840.41268X00), and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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